CRS-180

IF 1:1 Redundancy Switch

Accessory Product for use only with Comtech EF Data CDM-570 Modem
(Modem Firmware and Hardware Requirements Apply)

P/N MN/CRS180.IOM Revision 0

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Comtech EF Data is an ISO 9001
Registered Company.

P/N MN/CRS180.IOM
Revision 0
June 27, 2005

CUSTOMER SUPPORT

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Information on upgrading or returning a product
- Reporting comments or suggestions concerning manuals

Contact Customer Support using any of the following methods:

Mail: Comtech EF Data
Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

Email: service@comtechefdata.com

Internet: www.comtechefdata.com

Phone: 480.333.2200
(Main Comtech EF Data Number)
480. 333.4357 (Customer Support Desk)

Fax: 480.333.2161

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

1. Request a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support Department.
2. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
3. To ensure that the product is not damaged during shipping, pack the product in its original shipping carton/packaging.
4. Ship the product back to Comtech EF Data. (Shipping charges should be prepaid.)

For more information regarding the warranty policies, see Warranty Policy, p. 9.

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About this Manual

This manual provides installation and operation information for the Comtech EF Data CRS-180 70/140 Redundancy Switch. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the CRS-180 70/140 Redundancy Switch.

Related Documents

Comtech EF Data CDM-570 Satellite Modem Installation and Operation Manual

Conventions and References

Cautions and Warnings

Indicates information critical for proper equipment function.

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-metric to metric conversions.

Recommended Standard Designations

Recommended Standard (RS) Designations are equivalent to the Electronic Industries Association (EIA). Comtech EF Data will reference a RS designator throughout the manual.

Trademarks

All product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

REPORTING COMMENTS OR SUGGESTIONS CONCERNING THIS MANUAL

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EF Data Customer Support Department.

EMC COMPLIANCE

This is a Class B product. In a domestic environment, it may cause radio interference that requires the user to take adequate protection measures.

EN55022 COMPLIANCE

This equipment meets the radio disturbance characteristic specifications for information technology equipment as defined in EN55022.

EN50082-1 COMPLIANCE

This equipment meets the electromagnetic compatibility/generic immunity standard as defined in EN50082-1.

In order that the CRS-180 continues to comply with these standards, observe the following instructions:

- Connections to the transmit and receive IF ports (BNC female connectors) should be made using a good quality coaxial cable; for example, RG58/U (50Ω) or RG59/U (75Ω).
- All 'D' type connectors attached to the unit must have back-shells that provide continuous metallic shielding. Cable with a continuous outer shield (either foil or braid, or both) must be used, and the shield must be bonded to the back-shell.
- The equipment must be operated with its cover on at all times. If it becomes necessary to remove the cover, the user should ensure that the cover is correctly re-fitted before normal operation commences.

FEDERAL COMMUNICATIONS COMMISSION (FCC)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference; in which case, users are required to correct the interference at their own expense.

Note: To ensure compliance, properly shielded cables for DATA I/O shall be used. More specifically, these cables shall be shielded from end to end, ensuring a continuous shield.

SAFETY COMPLIANCE

EN 60950

Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN60950.

The equipment is rated for operation at +12 volts DC. It has a maximum power consumption of 1.0 Watts, and draws a maximum of 80 mA at +12 volts. The power supply current is, in all circumstances, supplied by either a single Comtech EF Data CDM-570 modem, or a pair of these modems.

This equipment meets the Safety of Information Technology Equipment specification as defined in EN60950.

EQUIPMENT CONNECTION

The CRS-180 is designed for operation ONLY with Comtech EF Data modems. These modems supply DC operating current (electronically fused and protected) and control signals for the correct functioning of this unit. Connection to other manufacturer's equipment could result in damage to the unit. The CRS-180 is not compatible with other Comtech EF Data modems.

ENVIRONMENTAL

The CRS-180 must not be operated in an environment where the unit is exposed to extremes of temperature outside the ambient range 0 to 50^0C (32 to 122^0F), precipitation, condensation, or humid atmospheres above 95% RH, altitudes (un-pressurized) greater than 2000 meters, excessive dust or vibration, flammable gases, corrosive or explosive atmospheres.

Operation in vehicles or other transportable installations that are equipped to provide a stable environment is permitted. If such vehicles do not provide a stable environment, safety of the equipment to EN60950 may not be guaranteed

TELECOMMUNICATIONS TERMINAL EQUIPMENT DIRECTIVE

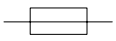
In accordance with the Telecommunications Terminal Equipment Directive 91/263/EEC, this equipment should not be directly connected to the Public Telecommunications Network.

LOW VOLTAGE DIRECTIVE (LVD)

The following information is applicable for the European Low Voltage Directive (EN60950):

<HAR>	Type of power cord required for use in the European Community.
	CAUTION: Double-pole/Neutral Fusing. ACHTUNG: Zweipolige bzw. Neutralleiter-Sicherung.

International Symbols:

Symbol	Definition
	Alternating Current.
	Fuse.

Symbol	Definition
	Protective Earth.
	Chassis Ground.

Note: For additional symbols, refer to “Cautions” listed earlier in this preface.

WARRANTY POLICY

This Comtech EF Data product is warranted against defects in material and workmanship for a period of two years from the date of shipment. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective.

For equipment under warranty, the customer is responsible for freight to Comtech EF Data and all related custom, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges **only** for return of the equipment from the factory to the customer. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

LIMITATIONS OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper installation or maintenance, abuse, unauthorized modification, or operation outside of environmental specifications for the product, or, for damages that occur due to improper repackaging of equipment for return to Comtech EF Data.

No other warranty is expressed or implied. Comtech EF Data specifically disclaims the implied warranties of merchantability and fitness for particular purpose.

EXCLUSIVE REMEDIES

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

DISCLAIMER

Comtech EF Data has reviewed this manual thoroughly in order to provide an easy-to-use guide to the equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding the equipment or the information in this manual, please contact the Comtech EF Data Customer Support Department.

Notes:

Chapter 1. INTRODUCTION

The CRS-180 IF 1:1 Switch Module is an IF Tx-Rx signal switch designed for use with IF satellite modems in a 1:1 configuration. The Tx side switches the online unit onto the transmit coaxial cable. The Rx side of the switch uses power dividers to provide both demodulators with the same IF signal from the LNB, thus reducing switching time.

The CRS-180 is designed to support 1:1 redundancy for Comtech EF Data CDM-570 modems. Table 1 summarizes the applications including requirements for supporting data switching hardware and software.

Figure 1. CRS-180

Table 1. CRS-180 Application Summary

Modem	1:1 IF Switch	1:1 Data Switch	Other Information
CDM-570	CRS-180	Built into the CDM-570	Order Data Interface Y-Cable

For correct operation of the CRS-180, the CDM-570 modems must have installed:

Firmware Version 1.1.4 (or higher)

Hardware Revision 3

If the modem does not meet this requirement, please contact the factory. Flash firmware upgrades are free, and may be downloaded from the CEFD web page. Hardware revision upgrades must be performed at the factory.

Chapter 2. INSTALLATION

For correct operation of the CRS-180, the CDM-570 modems must have installed:

Firmware Version 1.1.4 (or higher)

Hardware Revision 3

If the modem does not meet this requirement, please contact the factory. Flash firmware upgrades are free, and may be downloaded from the CEFD web page. Hardware revision upgrades must be performed at the factory.

2.1 UNPACKING

Inspect shipping containers for damage. If shipping containers are damaged, they should be kept until the contents of the shipment have been carefully inspected and checked for normal operation.

Remove the packing list from the outside of the shipping carton. Open the carton and remove the contents, checking the contents against the packing list. Verify completeness of the shipment and that the unit functions correctly. If damaged is evident, contact the carrier and Comtech EF Data immediately and submit a damage report. Be sure to keep all shipping materials for the carrier's inspection.

If the unit needs to be returned to Comtech EF Data, use the original shipping container.

2.2 MOUNTING

The CRS-180 is designed to be mounted in the rear of a rack containing the modems. Because of the module's small size and weight, one installation option is to let the module hang freely supported by the interfacing cables. Alternatively, a rack mounting kit (KT/11708) is available that allows the module to be mounted to the rack at the rear horizontally or vertically as shown in Figure 2.

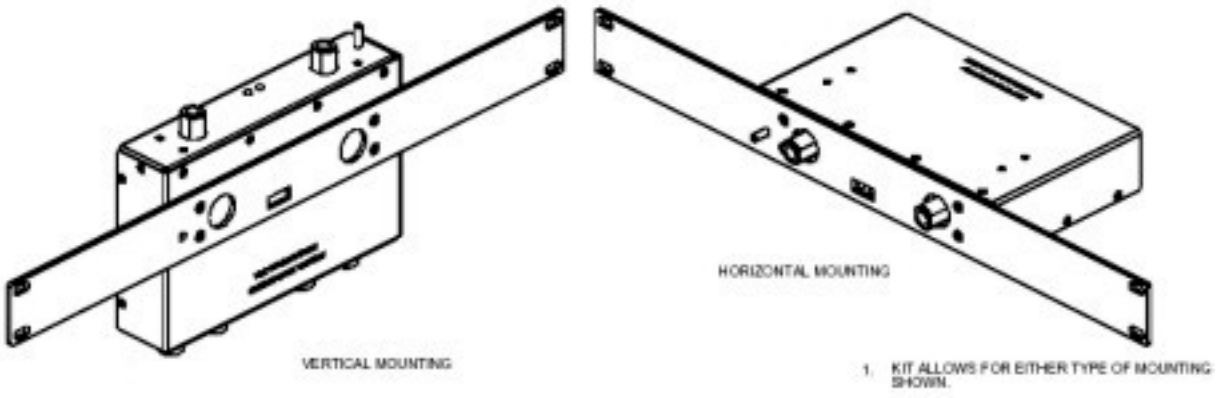


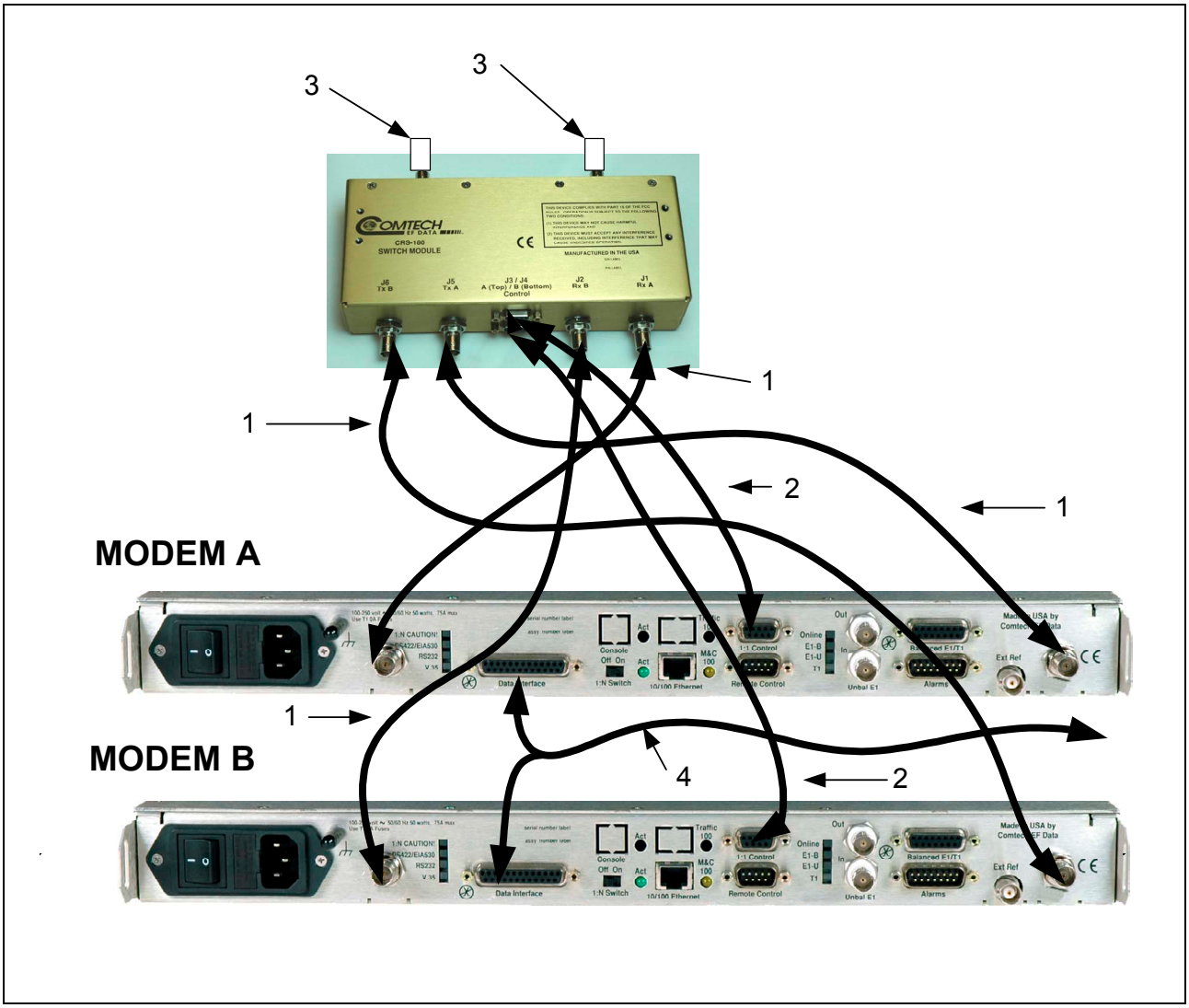
Figure 2. Rack Mounting Kits

2.3 CABLING WITH CDM-570

Notes:

1. KT/10553-1 is a G.703 Balanced 1:1 Y-Splitter and G.703 Unbalanced 1:1 Y-Splitter are not shown. This kit also is part of KT/11569-1/
2. KT/11569 is a kit containing the CRS-180, cables an transformers indicated in the Figure 3.

Figure 3 shows how to connect a pair of CDM-570 modems together with the CRS-180 via KT/11569. The data cable Y-adapter required for the installation depends on the users data interface, and must be specified at the time of order.



Item No.	Quantity	Part #	Description
1	4	PI/0946-1	IF Coax Cable, 50Ω, length = 4 feet
2	2	CA/WR9378-4	Control Cable, Universal, DB9 Male to Male, length = 4 feet
3	2	XF/BNC-50-75	50/70 Ω Transformer
4	1	CA/RB10461-1	Data Cable, 25 Pin D Sub, 1:1 Y Splitter
-5	1	CA/WR10522-1	G.703 Balanced 1:1 Y Splitter
-6	1	KT/10553-1	G.703 Unbalanced 1:1 Y Splitter

- Item Not Shown.

Figure 3. CDM-570 and CRS-180 Interconnect

It is essential to ensure that the control and IF connections, both Rx and Tx, are made correctly.

For example:

The Tx IF from Unit 'A' connects to the Tx IF port 'A' on the CRS-180 and Unit 'B' to "B', and the same for the Rx IF connections. Failure to observe this requirement will result in system malfunction.

When connecting the Control cable between the CRS-180 and the modems, ensure that screw locks on the 'D' type connectors are securely fastened. This will prevent the accidental un-mating of the cable, particularly when a standby unit is being removed or replaced.

Notes:

Chapter 3. FUNCTIONAL DESCRIPTION

The CRS-180 IF 1:1 Switch module performs the Tx and Rx coaxial switching required for redundant modem operation. It switches both Tx and Rx coaxial cables simultaneously.

3.1 OPERATION WITH CDM-570

Figure 3 shows a CRS-180 configured with two CDM-570 modems to form a complete 1:1 redundant modem. Software built into the CDM-570 M&C and cross connected status and communication between the modems allow the M&C's to jointly function for 1:1 switch control.

The control cables between the modems and the CRS-180 include three signals that are routed from one modem to the other through the CRS-180.

First	A serial communication line is routed from each modem to the other. The online unit interrogates the standby unit at regular intervals to determine its configuration. If a difference in configuration is detected, the online unit automatically reconfigures the standby unit so that the configurations are always synchronized. If the standby unit is replaced, it does not have to be manually reprogrammed to match the online unit; the process is entirely automatic.
Second	The online status output signal from each modem is routed to the other and to the switch logic within the CRS-180. Online control from Modem A overrides online control from Modem B inside the CRS-180. In the event that both modems indicate true online status through some malfunction, the CRS-180 switch will select Modem A.
Third	The fault status from each modem is routed to the other. The configuration, online status, and fault communication between the modems allows the offline modem to take over when the online unit indicates a fault.

Manual switchover is enabled from the front panel or remote control of the online CDM-570 modem. Automatic switching is inhibited by the user from the online unit. The user can select **Unit Faults** only, **Unit Faults** or **Receive Traffic Faults**, **Unit Faults** or **Transmit Traffic Faults**, or all three for the switchover criteria with the two switches on top of the unit. This selection provides a great deal of flexibility in the operation of the switch. Green LEDs on the antenna side of the CRS-180 indicate which modem is online.

The control cable from each CDM-570 modem to the CRS-180 also includes +12V power to operate the CRS-180. Power from both modems is diode OR'd so that the switch remains active if power is lost from one of the modems.

The CRS-180 provides IF redundancy.On the Tx side, it switches the Tx IF signal. The Rx IF signal from the RF equipment is split in a power divider to continuously drive both the online and offline demodulator. The offline demodulator can then maintain lock so that it is ready to quickly assume online status for receive traffic when a switchover is required.

Data switching is accomplished at the CDM-570 data interface itself. A Y-cable connects both the online modem and the offline modem to the terrestrial data source. Transmit data drives both modems in parallel so that the standby modulator is always ready to come online. Termination impedance for the modem line receivers is active in the online modem. On the Rx side of the interface, tri-state control of the offline modem line drivers keeps the offline modem from interfering with the Rx data traffic. Send timing output from the offline modem is also TRI-STATE®[1].

With the 'bridging' architecture of the CRS-180 (whereby identical traffic signals are routed to both Online and Standby units), the Controller State Machine can avoid unnecessary switchovers. By examining the fault status of both units, it can infer if the fault is external to the system.

For example, suppose the CRS-180 has been configured (via the Dip Switches) to switch following Unit faults or Transmit Traffic faults, and that the modems are configured for external clock operation. Now suppose that the external equipment (network, mux, router, etc.) fails. Both the standby and the Online units will now show a Transmit Traffic fault (No Clock Detected from Terrestrial Port). The CRS-180 Controller State Machine will see that both these faults have occurred at the same time (in fact, within a 0.5 second window), and infers that the fault is external. Therefore, no unnecessary switchover is initiated.

[1] TRI-STATE is a registered trademark of National Semiconductor.

Chapter 4. CONNECTOR PINOUTS

4.1 MODEM SIDE CONNECTORS

IMPORTANT

To maintain compliance with the European EMC Directive (EN55022, EN50082-1) properly shielded cables are required for data I/O.

The modem side connectors provide all necessary external connections between the CRS-180 IF Switch Module and the CDM-570.

Name	Ref Des	Connector Type	Function
RX A	J1	BNC	IF Input to Modem A
RX B	J2	BNC	IF Input to Modem B
TX A	J5	BNC	IF Output from Modem A
TX B	J6	BNC	IF Output from Modem B
Control A	J3	9-pin D (female)	Control Interface with Modem A
Control B	J4	9-pin D (female)	Control Interface with Modem B

Figure 4. Modem Side of Module

4.1.1 MODEM A CONTROL CONNECTOR

The Modem A Control connector is a 9-pin D female interface located on the modem side of the IF Switch Module. Refer to Table 2 for pin assignments. Pins 2, 3, and 4 carry signals looped through the switch module from Modem B to Modem A, while pins 6, 7, and 8 loop the same signals from Modem A through to Modem B. The 12VDC input, which is diode OR'ed with the corresponding 12VDC input from modem B, powers the switch module.

Table 2. J3A - Modem A Control Connector Pin Assignments

Pin #	Signal Function	Signal Name	Direction
1	Signal Ground	Ground	-
2	Modem B Serial Tx	AUX_SER_TX_B	Out
3	Modem B Online Indication	ONLINE_OUT_B	Out
4	Modem B Fault Indication	/FAIL_OUT_B	Out
5	Signal Ground	Ground	-
6	Modem A Serial Tx	AUX_SER_TX_A	In
7	Modem A Online Indication	ONLINE_OUT_A	In
8	Modem A Fault Indication	/FAIL_OUT_A	In
9	+12 VDC	+12VDC	In

4.1.2 MODEM B CONTROL CONNECTOR

The Modem B Control connector is a 9-pin D female interface located on the modem side of the L-Band Switch Module. Refer to Table 3 for pin assignments. Pins 2, 3, and 4 carry signals looped through the switch module from Modem A to Modem B, while pins 6, 7, and 8 loop the same signals from Modem B through to Modem A. The 12VDC input, which is diode OR'ed with the corresponding 12VDC input from modem A, powers the switch module.

Table 3. J3B - Modem B Control Connector Pin Assignments

Pin #	Signal Function	Signal Name	Direction
1	Signal Ground	Ground	-
2	Modem A Serial Tx	AUX_SER_TX_A	Out
3	Modem A Online Indication	ONLINE_OUT_A	Out
4	Modem A Fault Indication	/FAIL_OUT_A	Out
5	Signal Ground	Ground	-
6	Modem B Serial Tx	AUX_SER_TX_B	In
7	Modem B Online Indication	ONLINE_OUT_B	In
8	Modem B Fault Indication	/FAIL_OUT_B	In
9	+12 VDC	+12VDC	In

4.1.3 MODEM SIDE BNC CONNECTORS

There are four 50Ω BNC female connectors located on the modem side of the IF Switch Module. Refer to Table 4for details.

Table 4. Modem Side BNC Connectors

Type N Connector	Reference	Description	Direction
RX A	J1	RX-IF signal	Out
RX B	J2	RX-IF signal	Out
TX A	J5	TX-IF signal	In
TX B	J6	TX-IF signal	In

4.2 ANTENNA SIDE CONNECTORS

Two 50Ω female BNC connectors on the antenna side of the CRS-180 IF Switch Module provide the coaxial cable connections to the outdoor transmit and receive equipment (BUC and LNB). Refer to Figure 5.

Type N Connector	Reference	Function	Direction
RX	J7	IF Input	In
TX	J8	IF Output	Out

Figure 5. Antenna Side Connectors and Ground Lug

Note:

Chapter 5. SUMMARY OF SPECIFICATIONS

Equipment Type	IF 1:1 Redundancy Switch
Manufacturer	Comtech EF Data, Tempe, Arizona
Modems Supported	Comtech EF Data CDM-570
Operating Modes	Fully Automatic under control of supporting 1:1 switch. Manual under control of supporting 1:1 switch.
Architecture	Full bridging architecture with configuration synchronization. Tx switching guarantees the offline modem is muted at least 60 dB down. Rx IF signal fed to both Online and Standby units.
Switch Conditions	Tx/Rx switching follows state of supporting data switching via control input from data switch.
IF Switching/ Splitting	Tx IF: Switched by RF relay (1.5 dB max loss, 60 dB min ON/OFF isolation) Rx IF: Passive power splitting (4dB max loss)
Tx-Rx Isolation	70 dB min, 50 - 180 MHz
IF Impedance	Optimized for 50Ω. 75Ω supported with the use of external RF transformers (included).
IF Connectors	50Ω BNC Female
IF Frequency Range	50 - 180 MHz

Weight	1.1lbs (0.5kg)
Dimensions	1.7 H x 5.7 W x 4.1 D inches (43 H x 143 W x 104 D mm [excluding connectors]) 19-inch rack mounting kit available.
Power requirements	1 Watt maximum + 12 volts DC @ 80 mA (max) (Power supplied by CDM-570 modems)
Approvals	'CE' as follows: EMC Safety

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Unit	° Fahrenheit	° Centigrade
32° Fahrenheit	—	0 (water freezes)
212° Fahrenheit	—	100 (water boils)
-459.6° Fahrenheit	—	273.1 (absolute 0)

Formulas
C = (F - 32) * 0.555
F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoir.	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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